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The Magazine may also be purchased from THE METEOROLOGICAL OFFICE, SOUTH KENSINGTON, LONDON, S.W.7.

On Keeping Touch with the Weather of the World

AN eloquent appeal has been issued recently as a circular letter, dated July 10th, 1924, by Mr. Sampaio Ferraz, Director of the Brazilian Meteorological Service, for the inclusion in a single monthly publication of particulars of anomalous weather in all parts of the world. He points out that " this would encourage anyone interested in the subject to pursue further studies leading to a better comprehension of variations in general circulation and to more enlightened weather correlation work." " We here in Brazil have noted " he says, " that April and May last have run with very abnormal circulation and excessive rains, and hear that similar facts have been observed in other parts of the world. Would it not be valuable to have official reports from all the organized services, chiefly those that draw up daily charts, published in some meteorological review or magazine, so that one could in a glance, obtain a general appreciation of such anomalies as seem to occur this year in a striking manner ? "

Since the inauguration of the *Meteorological Magazine* (as distinct from *Symons's Meteorological Magazine*), it has been the rule to devote a page or more each month to weather abroad. The material for these pages has been derived in part from official reports, such as those which are transmitted to their London representatives by the Governments of India and Australia, but mainly from the descriptions of striking weather in the newspapers. In the selection of items of news, regard has been paid mainly to the obvious manifestations of the weather rather than to such matters as the distribution of pressure, of interest

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mainly to the professional meteorologist. Mr. Ferraz's letter is evidence that there is a demand for the immediate publication of information as to these phenomena, less dramatic, but perhaps of more far-reaching importance, and we propose to devote more space to them in future. The information cannot be gathered, however, from the newspapers, and we must therefore ask for co-operation of meteorologists in other countries. The art of long-range forecasting is at present not very far developed, but it is clear that it must be based largely on the summarising of weather anomalies over large areas, and that the more up-to-date the information the better. Monthly summaries are now available in most coun ries within a day or two of the end of each month, and we should be glad if the more abnormal features of such summaries could be communicated to the Meteorological Office immediately for use in the article on "Weather Abroad" in this magazine. For this purpose the reports should be in the hands of the editor not later than the 10th day of the month following that to which they refer. From many countries, reports can be sent by post with the certainty that they will arrive in time. In other cases, communication by cable will be necessary. Mr. Ferraz has himself set the example by despatching a telegram monthly from Brazil. We do not suggest that similar messages should be sent to us from every country with the same regularity. The idea is that a report is desirable whenever the atmospheric conditions have been so abnormal as to command the attention of foreign meteorologists.

The Meteorological Office publishes already the *Réseau Mondial*, a collection of meteorological statistics month by month for all parts of the world. The first volume of the *Réseau Mondial*, that for 1911, was in preparation in 1914; the war delayed the publication of subsequent volumes, but great progress has been made of late: the volume for 1916 has just been issued, and it is hoped that two volumes will be published annually until the minimum lag, which can hardly be less than 12 months, is achieved.

The notes in the *Meteorological Magazine* will give early intimation of abnormalities which will be recorded in greater detail in the tables of the *Réseau Mondial*.

Staff News. The degree of Ph.D. has been conferred on S. N. Sen by the University of London for two theses, the main one on "The Design of the Kew Pattern Barometer" and the subsidiary one on "Surface and Geostrophic Wind Components at Deerness, Holyhead, Gt. Yarmouth and Scilly." The latter thesis will be published shortly as Geophysical Memoirs No. 25. This is the first time the degree of Ph.D. has been given to a meteorologist in this country.

Thunderstorms and Normal Atmospheric Electricity

By G. C. SIMPSON, F.R.S.

IN the *Meteorological Magazine* for October, 1924, Mr. F. J. W. Whipple develops C. T. R. Wilson's suggestion that the negative charge on the earth's surface is a by-product of the electrical processes which take place in thunderstorms. It is now generally known that in regions of fine weather the surface of the earth is negatively charged, and that this charge is constantly passing into the atmosphere. In other words in fine weather regions there is a constant flow of negative electricity from the earth's surface into the upper atmosphere.

The chief problem of atmospheric electricity is to find out how the earth receives the negative electricity to supply this constant loss. For many years the answer was that rain is negatively charged, and so the negative electricity is restored in regions of rainfall. This simple explanation received its deathblow when actual measurements in widely separated regions of the earth's surface showed that rain brings down more positive than negative electricity. When this result became generally accepted, many able physicists attacked the problem again, but no one found a solution based on the known properties of electricity. The only suggestions which survived depended on some form of very penetrating rays—of the nature either of X rays or cathode rays—but no rays having the characteristics required are known definitely to exist. It therefore caused considerable surprise when Mr. C. T. R. Wilson in his important paper on "Investigations on lightning discharges and on the electric field of thunderstorms,"* made the suggestion referred to above. It is with the object of pointing out some of the difficulties of this suggestion that this short note is being written.

In the first place, it must be clearly understood that we are dealing only with a suggestion—a hypothesis. Wilson does not sketch out any mechanism of a thunderstorm which would result in the effect he supposes, nor does he give any experimental or observational evidence that such a process exists. He simply says, "If any considerable proportion of shower clouds are of positive polarity the upper atmosphere will receive an excess of positive electricity which may possibly be sufficient . . . . to supply the normal downward current of the fine weather regions"; surely a sufficiently guarded sentence.

Now let us examine what conditions must be fulfilled if the suggestion is correct. The earth's surface can be divided into two parts: (*a*) regions of fine weather, (*b*) regions of precipitation. The surface in (*a*) loses negative electricity all the time, therefore,

* *London, Phil. Trans. R. Soc.*, Vol. 221 A. 1920, p. 73.

if C. T. R. Wilson's theory is correct, the surface in (*b*) must on the whole either receive negative electricity or lose positive electricity. We know, however, that the surface in (*b*) actually receives positive electricity from the precipitation; this only makes the difficulty greater, for we have got to get rid of this electricity also.

The only solution would appear to lie in the electrical currents to which the large electrical fields associated with precipitation, especially in thunderstorms, give rise. These high fields set up something of the nature of brush discharges from all points exposed to the free atmosphere. Now, in a thunderstorm the electrical field at the earth's surface undergoes very rapid changes. Up to the present we have not sufficient measurements of these high fields to determine whether the positive or the negative fields are the greater. We do know, however, that positive fields are much more effective in dragging negative electricity out of the surface of the earth, than negative fields are in dragging out positive electricity. Unfortunately, however, this is in the wrong direction for the success of the theory. This difficulty might be overcome if the negative fields were much stronger than the positive fields, but as has already been stated we have no evidence that they are. If negative fields exist longer than the positive fields the difficulty might be surmounted and at first sight this seems to offer a loop-hole, for we do know from observation that negative potential gradient is more frequent than positive during precipitation. It must, however, be remembered that we are only concerned with high fields, and we know that most of the negative potential gradient during precipitation is very weak. We certainly do not know that high negative fields exist longer than high positive fields.

Space does not allow a more detailed discussion, but perhaps enough has been said to guard readers against imagining that the main problem of atmospheric electricity has been solved. More and more observations are required and they are being slowly accumulated. In the meantime suggestive articles like that of Mr. Whipple are very valuable.

Official Publication

The following publication has recently been issued :—

PROFESSIONAL NOTES—

No. 37. *Pressure Type in relation to Fog Frequency at Scilly during Summer Months.* By E. G. Bilham, B.Sc., D.I.C. (M.O. 245q.)

Although the general conditions suitable for the formation of fog at sea are generally well-known, viz. : warm, damp air blowing over colder water, yet the forecasting of sea-fog is notoriously

difficult. As a part of a wider investigation, Mr. Bilham has determined the frequency of occurrence of fog in the Scilly Isles, with different distributions of pressure in the neighbourhood of the British Isles. He found that sea fog is most likely when pressure is rather high over England and the North Sea, and there is a gentle flow of air towards Scilly from the Bay of Biscay. In such circumstances the odds against fog in 24 hours are as low as 7 to 5. On the other hand, in the 14 years covered by the investigation, sea-fog never occurred at Scilly in the summer months either in the northerly current on the flank of a V-shaped depression or in the easterly current blowing from central Europe. It may be noted that in the former case there would be cold air blowing over warmer water, in the latter case the warm air would be too dry to produce fog even though it was in contact with colder water.

Discussions at the Meteorological Office

November 10th, 1924. *Die thermische Schichtung der Atmosphäre.* By W. PEPPLER (Beitr. Phys. Atmos. XI., p. 79). *Opener*—Mr. E. V. Newnham, B.Sc.

The author of this paper has tabulated the isothermal layers or inversions of temperature obtained in 6,000 ascents made at Lindenberg during 1910 to 1916, and worked out their frequency in each stratum of 200 metres thickness in each month and in each season. The highest frequency is observed at all times in the lowest stratum : above 4,000 metres inversions or isothermal layers are rare. Large inversions above the level of 900 metres are most common in April and the autumn. These results are discussed and explanations of them attempted. Dynamical warming of the air by descent is thought to be the chief cause of inversions, but explanations involving the horizontal motions are invoked to explain the April and autumn maxima. It was pointed out in the discussion that statistical methods were not entirely satisfactory for dealing with upper air results, as such methods included under one head a variety of causes and effects, and the opinion was expressed that explanations of inversions could be arrived at only by the examination of each inversion in the light of the synoptic chart.

November 24th, 1924. *Investigation of the Dust Content of the Atmosphere.* By H. H. Kimball and I. F. Hand (Washington M.W. Rev., Vol. 52, March, 1924, p. 133). *Opener*—W. H. Pick, B.Sc.

One of the steps taken by the International Union for Geodesy and Geophysics at the Meeting at Rome in 1922 was to authorize the purchase of some of the instruments designed by Dr. Owens

for the collection of samples of atmospheric dust. These instruments were to be issued to meteorological institutes in various parts of the world so as to stimulate enquiry. The first-fruits of this wise action are to be found in Dr. Kimball's report on observations near the ground and at various heights reached by aeroplanes in the neighbourhood of Washington. The technical difficulties found in manipulating the apparatus in an aeroplane appear to have been satisfactorily overcome. Of the results which are reported, we may mention two: (*a*) The number of dust particles is of the same order at heights up to 6,000 ft.; above that height the number generally falls off rather rapidly. (*b*) Near the ground the number of particles is lower in the afternoon than in the morning, but at 2,000 ft. and upwards the number of particles increases, if anything, in the afternoon.

The discussion brought out the reluctance of meteorologists to accept the doctrine that haze in English country districts is mostly smoke from the towns. Dr. Owens gave evidence, however, that the dirt-producing haze on the east coast was smoke from the other side of the North Sea. The relation between Aitken nuclei and the dust revealed under the microscope on Dr. Owens's slides was also discussed. Aitken himself believed that opacity of the atmosphere could be produced by the condensation of water on nuclei, even when the humidity was far below saturation. No recent evidence for this hypothesis is available. The hope was expressed that it would be investigated again with the aid of both Owens's and Aitken's counters.

THE subject for discussion on January 19th, 1925, will be a paper by E. Gherzi, entitled: *Étude sur les microseismes* (Observatoire de Zi-ka-wei). *Opener*—Capt. H. W. L. Absalom.

Royal Meteorological Society

AMONGST the meetings of the month, pride of place must be given to the joint meeting of the Physical Society of London and the Royal Meteorological Society. It is the first time the latter Society has participated in a joint meeting with another society, and the Council may be congratulated on the success of the innovation. The meeting was held on November 28th at the Imperial College of Science, Mr. F. E. Smith, President of the Physical Society, being in the chair. The discussion, which was devoted to Ionization in the Atmosphere and covered a wide range, was opened by Dr. Eccles with an historical résumé. Dr. Chree dealt with the variations in ionization near the ground. He appealed most strongly to his audience when he deplored the loss which science had suffered by Lord Kelvin having to spend his life as a University Professor instead of as Head of a Geophysical Observatory. Dr. Appleton gave an account of

geophysical influences on the transmission of wireless waves, and pointed out how the establishment of broadcasting stations had provided opportunity for the repetition of experiments which in the early days of wireless telegraphy required careful organization. Mr. Watson Watt told of the development of the investigation of "atmospherics," and gave reasons for the belief that all atmospherics are produced by distant lightning. Mr. C. T. R. Wilson followed with theories as to the ionization produced by thunderstorms. He did not devote much time to the question how the charges are produced which are dissipated in the lightning flash, but developed a new hypothesis according to which the electrostatic field due to an electrified cloud may be strong enough to produce ionization of the rarified air in the region 50 kilometres or more above the clouds. He challenged Dr. Simpson to deny the existence of clouds of positive polarity (with + charges at the top, and — charges below). This challenge was duly accepted by Dr. Simpson a few minutes later. The last paper, by Professor S. Chapman, on the evidence of terrestrial magnetism for the existence of highly ionized regions in the upper atmosphere was interesting to meteorologists as showing how the discussion of the atmospheric tides produced by the sun and moon is a necessary preliminary to the theory of the daily movement of the magnetic needle. The electric currents in the high atmosphere are governed on the one hand by these tides, and on the other hand by the development of ionization at various levels.

THE monthly meeting of the Society was held on Wednesday, November 19th, at 49, Cromwell Road, South Kensington, Capt. C. J. P. Cave, President, in the Chair. The following papers were read:—

Sir Gilbert Walker, F.R.S.—Note on Bjerknes's Contribution of 1921 to the Mechanics of the General Circulation.

W. H. Dines, F.R.S.—The Correlation between Pressure and Temperature in the upper air, with a suggested explanation.

Correspondence

To the Editor, *The Meteorological Magazine*

Precision in Rainfall Measurement

REFERRING to Mr. M. J. Salter's letters* on the above subject, I fear the average observer would not take the trouble to adopt either of his plans for obtaining precise small measurements of rainfall. Since reading his first letter and your comment thereon,

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**Vide Meteorological Magazine, Vol. 59, 1924, p. 210 and p.239.*

however, I have experimented with having two glass-bottle receptacles for my 5 in. "Snowdon," instead of only one, and had already been using a plan similar to Mr. Salter's second one, which I have found most satisfactory. Apart from the accuracy obtained for small amounts, the fact of having another receptacle ready to replace the one in use is most convenient when rain is falling at the time of observation, and I am sure that, for this reason alone, Mr. Salter deserves the thanks of the large army of observers reporting to the British Rainfall Organization.

D. W. HORNER.

47, *Forest Road, Tunbridge Wells, November 19th*, 1924.

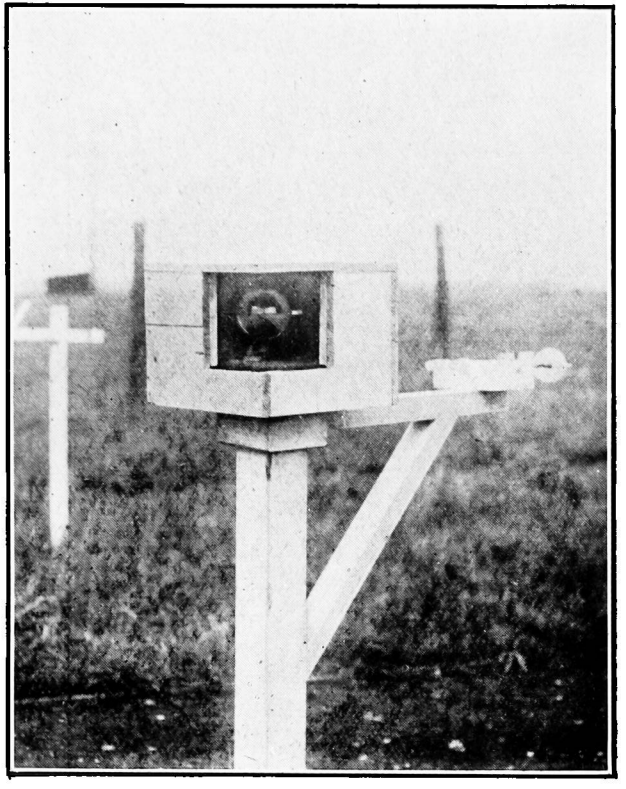
A Roof for the Campbell-Stokes Sunshine Recorder

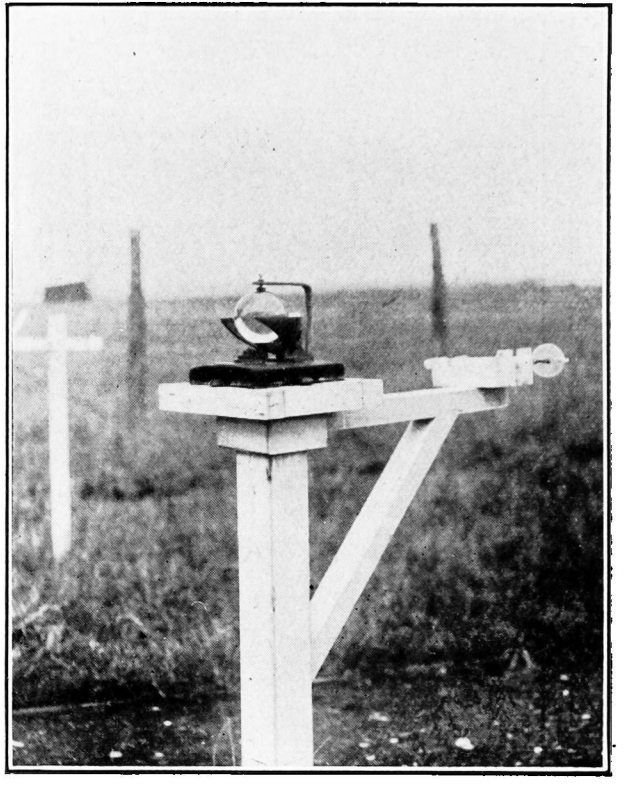
THE deposition of hoar frost on the glass sphere of the Campbell-Stokes Sunshine Recorder during winter nights is frequently sufficient to cause the loss of an hour's trace the following morning. The instructions in the *Observer's Handbook*, state that if snow or hoar frost settles on the recorder, it should be removed at once, and at some observatories it is the rule for an observer to remove the hoar frost at sunrise, but this is not always practicable. The question assumed importance at Porton, where in the course of a certain investigation it became necessary to know whether the absence of sunshine trace in the early morning was due to a clouded sky or to a coating of hoar frost on the glass sphere. It was therefore decided to try to devise a cover for the sunshine recorder which would prevent the formation of hoar frost on the instrument, and yet enable it to receive early morning sunshine. The device, which was employed all last winter, consisted of an inverted box with the sides cut away at the south-east angle. The two photographs show the sunshine recorder with, and without, this cover in position. The cover, which is used only during the winter months from October 1st to March 31st, is put over the recorder after sunset and removed at some convenient time in the morning.

It is not possible to state numerically the advantage gained by this means, because there is no other sunshine recorder sufficiently near to permit a comparison being made, but it is believed that this cover is fairly effective, although after nights of very heavy frost the exposed face of the glass sphere was sometimes found to be frosted. It is not claimed that the cover in its present form is the best that can be devised, and the idea is put forward in the hope that somebody, with two recorders at his disposal, may be induced to carry out an investigation.

N. K. JOHNSON.

Meteorological Dept., Experimental Station, Porton, November 14th, 1924.





THE CAMPBELL-STOKES SUNSHINE RECORDER AT PORTON
ROOFED AND UNROOFED

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ELLIPTICAL LUNAR CORONA OBSERVED AT ABERDEEN, OCTOBER 11TH, 1924

An Elliptical Lunar Corona at Aberdeen

A lunar corona of elliptical form was observed here at 19h. 30m. G.M.T. on October 11th, and remained visible unchanged for a period of about twenty minutes. The phenomenon consisted of an elliptical ring eccentric about the moon. The colours were distinctly marked, and gradated from a warm creamy glow near the moon through lemon-yellow to the orange-red-brown of the ring. The upper half of the ellipse was bounded by a band of violet light of a very pure colour. This band, thin at the top, widened at the sides of the ring. Above this came a broader arc of light of a tint resembling "electric-blue," but of a less pronounced brilliance than the violet band. Next this, a band of dull olive-green formed the outer top edge of the display. All three bands terminated at the sides about level with the horizontal diameter of the ellipse. The sky round the moon was covered with a coarse streaky type of cirro-stratus; wisps of fracto-stratus were seen at times.

The corona became irregular by 20h., but later assumed the usual circular form, showing a faint tint of cream colour with very little, if any, indication of the brownish red ring. Afterwards the corona disappeared, and a lunar halo formed. The sketch*, although accurate in form, lacks the necessary luminosity.

The principal dimensions were obtained by estimation in terms of the apparent diameter of the moon and were as follows:—

Bottom of moon to lower edge of ellipse ..	about	3 diameters.
Top of moon to upper edge of ellipse ..	,,	5 ,,
Horizontal diameter of ellipse between outer edges	,,	12 ,,
Distance between outer edges of violet arc	,,	16 ,,
Vertical width of electric blue band ..	,,	3 ,,
Vertical width of green band	,,	1 diameter
Elevation of moon	,,	30 degrees.

Unfortunately, I was the only member of the staff to notice the earlier corona, although I have since then heard several comments from the general public on the extraordinary colours shown.

P. F. JARROLD.

The Observatory, King's College, Aberdeen, October 27th, 1924.

The Great Snow Storm in Cornwall

IN our local daily paper, the *Western Morning News and Mercury*, we have a weekly article on "Antiquarian Lore in the West," edited by an excellent authority. In to-day's issue, we have undoubted evidence of a heavy snow-fall in west Cornwall in December, 1630.

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* Mr. Jarrold's sketch is coloured. We regret that it has only been possible to reproduce it in black and white.

In the Phillack Parish Register of Burials, is recorded the burial of three persons on December 11th, and one on the 12th, 1630, and opposite their four names is the note "Died in the snow." In the Breage Register, is a similar record, namely one on the 11th, two on the 12th, and one on the 19th of December, 1630, with the note "*Hi quatuor perierunt in nive.*" The small town of Hayle, between Penzance and Cambourne, is in Phillack Parish, and Breage is 7 miles to the south-east and 3 miles west-north-west of Helston.

Apparently, the fall must have been very heavy and lasted several days, as it would appear that the body buried on the 19th was not found for several days: on the other hand he may have been found alive and died later from the effects.

CHAMBRÉ C. VIGURS.

Newquay, Cornwall, November 17th, 1924.

NOTES AND QUERIES

The Laboratory at the Meteorological Office, South Kensington

WHEN the Meteorological Office moved from Victoria Street to South Kensington in 1910, it found itself equipped for the first time with a laboratory in which the apparatus and instruments used in meteorology could be tested and in which experiments could be made with a view to effecting improvement in all the material used in meteorological work. After the British Rainfall Organization was absorbed in the Meteorological Office, it became necessary for full provision to be made for the testing of measuring glasses for rainfall. The apparatus shown in the illustration has been specially designed for this purpose. It will be seen that the precise amount of water corresponding with each graduation can be delivered into a measure from the appropriate burette. Four burettes are provided to allow for graduations in inches and millimetres of the measures for 5 inch and 8 inch gauges.

Some other additions necessary for experimental work and for the examination of the peculiarities of instruments as well as for testing them have recently been made; among these are a pressure chamber large enough to hold an ordinary barograph (or a number of aneroid barometers and meteorographs) for calibration against a standard mercury barometer; a sensitive micromanometer, which is used primarily for testing pressure tube anemometers; and horizontal and vertical collimators for the testing of theodolites. Facilities are also available for the testing of pilot balloons and the clocks used in recording instruments.

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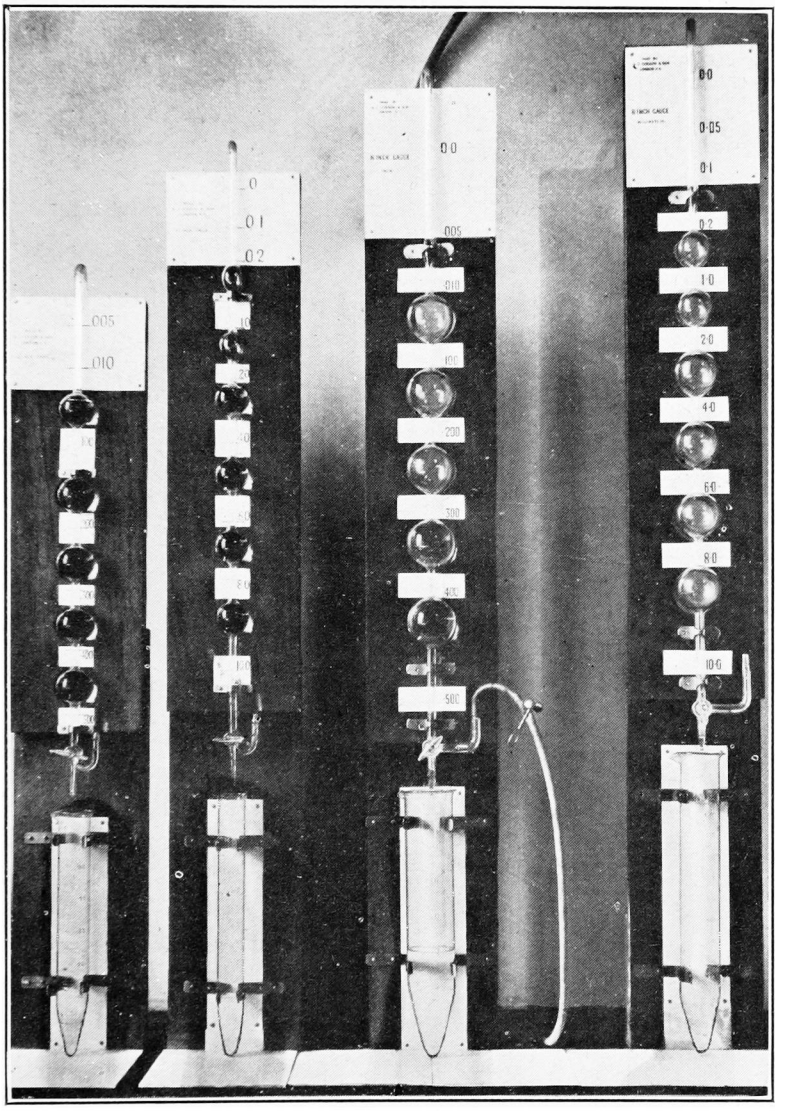

APPARATUS FOR TESTING RAINGAUGE MEASURES AT THE METEOROLOGICAL OFFICE, SOUTH KENSINGTON

Sir Oliver Lodge's Views on Electrical Precipitation

On October 29th, Sir Oliver Lodge delivered a lecture before the Institute of Physics, on "Electrical Precipitation." Electrical precipitation is now adopted on a large scale for extracting the suspended solids from flue gases: this is not only useful as a means of keeping the air from being fouled, but in many metallurgical processes, the material which is recovered is of great value. Moreover, the clean gases are more efficient for heating boilers, etc., than smoky gases would be. The lecturer dealt also with the part played by electrical forces in the production of rain. In his view, the coalescence of the small droplets which predominate in clouds, into the large drops which fall as rain, is due to the electrical charges carried by the droplets. The early experiments which he described lend considerable support to this theory.

At the end of his lecture, Sir Oliver discussed how man would set about the production of rain artificially. We quote his peroration: "There are difficulties about the electrical controlling of the atmosphere. Is that to be the one region of the earth over which man has no power, and about which he must succumb supinely to fate? I do not believe that it is. I feel sure that if the control of the atmosphere is felt to be an important problem, it will be tackled either now or by posterity. The considerations to which I have called attention in this lecture are such as to give some kind of clue, perhaps only the inkling of an idea. There are meteorologists who know far more about the atmosphere than I do. They will, I expect, be conservative in their estimate. It may be that physicists rush in where meteorologists fear to tread! But, anyhow, the problem strikes me as no more difficult than the problem of disease at one time appeared, and I venture to regard the future with some hope."

The British Rainfall Organization in the service of Water Engineers

Two papers dealing with rainfall were on the programme of the Annual Meeting of the Institution of Water Engineers, held on December 4th, 1924. A posthumous paper by the late M. de C. S. Salter was devoted to the construction of a rainfall map of the British Isles on the scale 2 miles to the inch. Isohyets showing the annual rainfall have been drawn on this scale for more than half of the country, and, as Mr. Whipple mentioned in the discussion, the work is proceeding steadily. Two maps reproduced in Mr. Salter's paper illustrate the technique of rainfall mapping, one showing how over-exposure of rain-gauges to the wind must be allowed for, the other indicating that even a

hilly area (the Trossachs) can be mapped with comparatively few observations, so that when more observations are available they fall into place. Stress is laid, however, on the desirability of numerous accurate records as the best safeguard against error.

The second paper, "Fluctuations of Annual Rainfall: three driest consecutive years," was by Mr. J. Glasspoole. In water-works practice it is common to provide reservoirs on the assumption that the water available each year will be 80 per cent. of the average rainfall, minus an allowance for evaporation. It seems that the fraction 80 per cent. was adopted originally on the ground that a certain amount of storm water would be unsuitable for storage. Another reason was found by Sir Alexander Binnie, who pointed out that the average rainfall of three driest consecutive years was about 80 per cent. of the normal rainfall. A water conservation scheme must provide enough water for its clients in a run of dry years. It is unprofitable to enlarge the reservoirs of a restricted gathering ground if enough water to fill them is not to be expected in dry years. The better policy is to utilise additional gathering grounds. Mr. Glasspoole's paper is concerned with the question whether the fraction 80 per cent. is appropriate for all parts of the British Isles. He finds that in the north-west of Ireland the rainfall is so reliable that more than 90 per cent. of the normal can be anticipated in the three driest consecutive years. On the other hand, in a few parts of England and Scotland there is a slight risk of less than 80 per cent. occurring. The paper serves incidentally as an index showing, for each part of the country, which were the three driest consecutive years.

The Great Dew Pond Myth

UNDER this forceful title, Mr. Eric W. Walford has written for the October number of *Discovery* a discussion of the nature of the hillponds of the south of England. The work of Mr. E. A. Martin on the subject is clearly summarised, but we should have liked to see a reference to Martin's book.

There are two details which call for comment. Martin came to the conclusion that the dew ponds in some way collected a deposit which was not rain. It appears, however, that he did not realise the difficulty in measuring rainfall on the open downs. "In one month," he writes,* "from August 25th to September 24th, 1908, there fell into a rain-gauge placed outside the bank of my experimental pond 2·11 in. In a rain-gauge placed in the centre, on the bottom of the depression there fell in the same period 2·98 in." Nowadays, we should explain the discrepancy by saying that the gauge outside the bank was catching the wind too much, so that the eddies whirled the rain away and that the

* E. A. MARTIN. *Dew Ponds: History, Observation and Experiment.*

gauge in the middle of the pond gave the true rainfall. Similarly when Martin records that the pond rose ¼-in. when the rainfall was ·11 in., we suspect that ·25 in. would have been a better estimate of the rainfall.

The other point is that Martin, and Walford follows him, refers to the mists on the Downs as sea mists. This name is surely very misleading. The mists formed on the hill-tops when the wind is blowing off the sea, represent either the low clouds from over the sea, or clouds formed in the air as it rises to pass over the hills. The production of drizzle in such rising air is no doubt the source of much of the precipitation in the so-called dew ponds. There is evidence that in some cases the drippings from bushes add appreciably to the water in the ponds, but the ponds without bushes are equally successful in retaining water throughout the year. It is, therefore, desirable to lay stress on the drizzle and rain as the principal source of supply.

Dramatic Weather in the United States: June, 1924

THE *Monthly Weather Review* for June, 1924, contains vivid descriptions of two remarkable incidents.

1. On June 28th, there was a very destructive tornado, the track of which passed across the southern tip of Lake Erie. A 95-foot gasoline yacht, *Oswichee*, encountered the storm. Dr. M. L. Combes who was on the boat, writes, "The fury lasted for 20 minutes with continuous streak lightning: the roar was so great that we could not hear the thunder. Then the waterspout went across our stern, drenching us with water, followed by a heavy spray and a very decided suction which lifted the pipe from our furnace . . . . It also pulled up the canvas which covered the top deck and was nailed round the edges." Eighty-three people lost their lives through this tornado, the majority where it left the lake at Lorain, Ohio.

2. On June 13th, unprecedented rain occurred in Carter County, Tennessee. The highest reading of a rain-gauge was 11·24 in., but water to the depth of nearly 15 in. was found in a "stone crock," at Cardens Bluff. It is reckoned that at least 12 in. out of the 15 must have fallen in 3⅛ hours. There are indications that at times the rainfall was much more intense than these figures would suggest. "Those who saw the storm say that not only was there a most intense general rain over the region, but that at many places the clouds broke as if punctured and discharged perfect streams of water. The truth of this statement is shown by deep gashes or scars, almost resembling cuts from a hydraulic jet that were cut into the hillsides at places where there had been no depression or watercourse." In a small ravine at Cardens Bluff, two houses were demolished,

and nine of the occupants drowned. The catchment area of the ravine does not exceed 15 acres. "One of the inhabitants who escaped, stated that a wall of water, rock and earth 8 to 10 feet in height crashed into the houses without perceptible warning, totally wrecking them. He himself was thrown 30 ft. or more by the force of the blow and was severely injured." It is interesting to compare the photographs showing the "cuts from a hydraulic jet," with those obtained by Mr. Dansey* in the Black Mountains in Wales after a similar downpour there in 1907.

The Austrian Daily Weather Report

IN the Austrian daily weather report (Wetterbericht der Zentralanstalt für Meteorologie und Geodynamik in Wien), a chart is now being devoted to stream lines and rain areas. The innovation adds to the interest of the reports as the association of rainfall with converging winds is continually brought to mind. For example: in the chart for August 31st, 1924, a south-westerly air-stream is seen to be traversing France and impinges upon a south-easterly stream which extends from Central Europe to Iceland and Norway. A large rain area is shown, the centre of which lies near the line of discontinuity separating the two currents.

It seems an excellent plan to draw attention to the principal air-streams in this way, but in the reports under consideration there is sometimes an apparent discrepancy between the stream-lines and the actual surface winds; thus, on August 24th, there is a stream line indicating that a branch of a south-westerly current was following the Baltic coast and passing to the north-west of a centre of low pressure. The arrow showing a south-westerly current over Germany was in this case carried a little too far. Other discrepancies of this kind are to be observed occasionally, but in general there is good agreement.

A Chronicle of Catastrophes

A NEW journal, *Matériaux pour l'étude des Calamités*," owes its existence to the appeal of Senor Giovanni Ciraolo, President of the Italian Red Cross Society. It is published in Geneva by the local Geographical Society for the International Red Cross Organization. The two numbers of the journal which have appeared contain useful papers on such subjects as landslides (to which Italy is particularly subject), and locusts (a plague

* *British Rainfall*, 1907. p. 33.

which is being grappled with already on international lines). The journal contains chronicles of the catastrophes occurring in all parts of the globe. The chronicle in the first number covered the whole of the year 1923, but in the second number only one quarter, (July to September, 1924), is reviewed and the information is much more detailed. The first two sections of the later chronicle are devoted to earthquakes and volcanic eruptions, the last one to locusts, but all the catastrophes in the nine intermediate pages are attributed directly or indirectly to the weather, the headings being landslides ; floods ; tornadoes ; cyclones and hurricanes ; droughts ; famines ; fires (mostly forest fires). The chronicle promises to be very useful for reference.

The South African Irrigation Department Magazine

WE learn with great regret that the publication of the *Magazine*, issued by the South African Irrigation Department, is likely to be discontinued after the next issue. The *Magazine* has appeared quarterly for three years. The last number, that for September 1924, contains many interesting articles, amongst them a description of the Pretoria hailstorm of December 25th, 1923, by Mr. G. W. Cox. This thunderstorm was remarkable for the damage done by hail ; some effective photographs are reproduced, one shows a large hole pierced through a sheet of galvanised iron.

The British Antarctic Expedition

FOR the publication of the scientific results of Scott's last expedition, a sum was allotted from the fund raised by public subscription in 1913. The biological reports have been published by the Trustees of the British Museum, the physical by a publication Committee with Colonel H. G. Lyons as Honorary Editor. These physical reports were written by Dr. Simpson, Dr. Chree, Professor Griffith Taylor, C. S. Wright, R. E. Priestly and F. Debenham, all, with the exception of Dr. Chree, members of the expedition. The " Miscellaneous Data," which remained for publication have been collected by Colonel Lyons. They include details of the equipment of the expedition and should be of the greatest value to anyone organising another attack on the Antarctic continent. Some of the notes are of more general interest. Thus, we learn that goggles should be designed with adequate ventilation : otherwise dew and hoar frost condense on the glasses when the wearer is exerting himself and perspiring. None of the compositions for preventing deposition of dew on glass was found to be of any service. Again, " a depressing

effect was often caused by the almost total diffusion of the light, the clouded sky and the snow surface appearing of equal colour and light intensity, so that the two, and the horizon between, were indistinguishable from one another. The result was that there was often complete loss of contrast. No shadow was cast and the horizon blended with the dead white of the Barrier surface. One could stand almost alongside a cairn, nine feet high, and be unable to see it. No shadow being cast, one was quite unable to distinguish *sastrugi* or any snow projections on the surface before falling over them. Often on the better days, after sighting a cairn a quarter of a mile away, a stumble would cause it to be lost ; after searching for long periods, one would realise that, in the endeavour to pick up the cairn, a false horizon was being searched."

Mr. C. S. Wright contributes a discussion of the merits of sledges of different types ; the sledge which is made with narrow runners for travelling on hard ice will not serve for tracking over soft snow, and where a variety of conditions may be met with it is good policy to prepare for the worst. Quite apart from any question of the hardness of the snow, however, the surface temperature has an important influence. In man-hauling sledges, it was found that the friction decreased steadily as the temperature rose, the presence of brilliant sunshine having an effect which was more than a psychological one on the speed of advance. Below zero Fahrenheit friction seemed to increase progressively as the temperature fell, as if a greater and greater proportion of the friction were due to relative movement between the snow grains and less to sliding friction between runner and snow. It was found that sledging, even in moderately hard snow, involved daily exertion not less than that corresponding to pulling a load of 250 lb. per man up a glacier of bare ice 3,000 feet high, the distance of travel being the same in each case.

Colonel Lyons and his Committee are to be congratulated on the conclusion of a great work, a worthy memorial of the British Antarctic Expedition.

Popular Meteorology in France

AN up-to-date little book, " L'Atmosphère et la Prévision du Temps," by Prof. J. Rouch, has recently been published as one of a series of the " Collection Armand Colin (section de physique)." In the first part of the book the methods of observation of temperature, pressure, winds, &c., are described. There follows a description of the distribution of the elements over the globe and their local variations. The last part of the book is devoted to forecasting both for long and short periods, and the uses of meteorology in connection with agriculture and war.

The author has been very successful in compressing much information into a small compass. He has been careful to omit superfluous detail from his diagrams; perhaps, in some instances, this economy has been carried too far, as in the maps (pp. 95, 98) showing by means of shading the areas of highest and lowest pressure for January and July. In these maps there is no standard value beyond which an area is designated high or low; for example, over Siberia, pressure has to reach 775 mm. before it is included in a high, and over the Pacific or Atlantic only 767 or 766 mm. It is difficult to see what has been gained by this lack of consistency. The allusions in the chapter on the application of meteorology to military arts makes us wish that the author would give us a fuller account of meteorology in the Great War. How many of us know of the squall of May 5th, 1916, which carried away 20 captive balloons on the Western Front? It is interesting to learn that the naval gunner is as anxious as the military to utilise the results of pilot balloon observations, and that the meteorologist is able to meet the demand " Pour les altitudes supérieures, on a recours au sondage aérologique par ballon-pilote, pas plus difficile à exécuter à bord qu'à terre." Every reader will agree that the book is worthy of the motto of the series: " Vulgariser sans abaisser."

The Light of the Night Sky

THE background from which the stars stand out on a clear night is not mere darkness. See how the sky contrasts with the branches of the trees when you travel along a shady road by starlight. In recent years Lord Rayleigh has shown that an important component of the light of the night sky in all latitudes is the green auroral light. He has now* devised apparatus by which visual observations of the intensity of the light can be made. He uses as a standard the phosphorescence produced in potassium uranyl sulphate by radium, and by the aid of suitable filters he isolates not only the green but also the red and blue components of the sky light. Remarkable variations in the intensities of the components are found; these variations are comparatively slow; there is close agreement between observations on consecutive nights, but the light changes its character from month to month. It is not blue like the light of the day sky, in fact the observations with the light filters suggest that the night sky may be as yellow as the light from an ordinary metal-filament glow lamp. Of course the unaided eye can not appreciate the colour of such faint light. Lord Rayleigh con-

* The Light of the Night Sky: Its Intensity Variations when Analysed by Colour Filters. By Lord Rayleigh. *London, Proc. Roy. Soc. A*, Vol. cvi., 1924, p. 117.

siders that the illumination of the night sky can not be due to diffuse sunlight, he would explain it as a phosphorescent glow excited in the upper air during the day and persisting during the night. As the apparatus described by Lord Rayleigh is simple it may be anticipated that observations will be made at numerous stations in all latitudes. There is an opening for good work by amateur meteorologists.

Reviews

West Indian Hurricanes and other Tropical Cyclones of the North Atlantic Ocean. By Charles L. Mitchell. Monthly Weather Review Supplement, No. 24. Size $12\frac{1}{4} \times 9\frac{3}{4}$, pp. iii. + 47. *Illus.* Washington, 1924.

Mr. C. L. Mitchell, who is one of the forecasters of the Washington Weather Bureau, formed some time ago the opinion that no storms ever originate in the eastern two-thirds of the Caribbean Sea (east of 78° W). To test this view he considered all the West Indian hurricanes, the tracks of which had been drawn in earlier publications as though the storms had originated in this area. Using more material than had been employed formerly, he re-drew the tracks, and substantiated his opinion. He was led on to the preparation of a valuable publication, which must rank as the most comprehensive and up-to-date work on the general characteristics of the tropical cyclones of the North Atlantic. Charts are shown giving the tracks of numerous storms in the different months, and many individual storms are described in detail. It is interesting to note the large number of storms that pass across the Atlantic to north-west Europe between August and October, and the rarity of this phenomenon in June and July. These cyclones are, of course, indistinguishable from ordinary temperate cyclones long before they reach European waters.

E. V. NEWNHAM.

News in Brief

A lecture on "Thunderstorms," was delivered before the Royal Aeronautical Society by Dr. G. C. Simpson, F.R.S., on Thursday evening, November 27th.

NEWS has lately been received that Amundsen's ship, the Maud, has been compelled to give up the attempt to drift across the North Pole. Captain Amundsen left Norway in the Maud in June, 1918, intending to enter the pack ice off the New Siberian Islands, but it was not until 1922, after Amundsen had left the ship to attempt the flight across the North Pole, that the Maud became frozen in the pack ice to the north of Point Hope,

and began to drift. The progress of the drift has since from time to time been reported by wireless, and from December, 1922, weather messages have been transmitted which have helped to complete the circle of observations round the northern hemisphere.

The Weather of November, 1924

CLOUDY weather, two short cold spells, rainfall below normal in the northern districts, and a remarkable gale in the south were the most noteworthy features of November. During the first two days unsettled weather prevailed, with strong winds and gales (force 10 (60 m.p.h.) at St. Ann's Head at 13h. on the 2nd) along the south-west coasts and heavy rain in the south; 46 mm. (1·80 in.) being recorded at Tynywaun (Glamorgan), 41 mm. (1·60 in.) at Brushford (Somerset), and 40 mm. (1·57 in.) at Holne (Devon). Floods occurred in the neighbourhood of Exeter and in the Thames Valley. In the rear of this depression an anticyclone passed slowly eastwards across the British Isles, causing quiet fair conditions with much local mist and fog. Northerly winds prevailed at first and were associated with slight showers of hail or snow in a few places and a drop in temperature which spread gradually southwards on the 3rd and 4th. Severe frost occurred inland on the mornings of the 4th, 5th and 6th, a " grass minimum " temperature of 10° F. being recorded at West Linton on the 6th, and of 11° F. at Rhayader (Radnor) on the 5th. From the 9th to the 11th the winds were southerly and the weather mild, with rain in the west. On the 12th a secondary depression developed and crossed southern England, causing heavy rain locally, 30 mm. (1·18 in.) fell at Shoeburyness. It is noteworthy that the approach of this depression was accompanied by a general increase of pressure, and that barometer readings near its centre were about 1025 mb. Further depressions over the northern Atlantic caused a continuance of the unsettled weather in the extreme west and north until the end of the month, but under the influence of an anticyclone, which spread south-westwards from southern Scandinavia, quiet fair weather prevailed in the south for nearly a week. With the clearer skies and a steady flow of air from the Continent there was a pronounced fall of temperature. Screen minimum readings were as low as 20° F. or 21° F. in some districts on the 17th and 18th, and day temperatures also did not reach 40° F. at several stations on those two days. Much local morning fog and midday sunshine were associated with the frost. During the last ten days depressions from the Atlantic spread again over the whole of the kingdom, causing strong winds and frequent rain, which was heavy locally, *e.g.*, 85 mm. (3·35 in.) were reported from

Dungeon Ghyll and 50 mm. (1·97 in.) from Sedbergh (Yorks) on the 22nd, 49 mm. (1·93 in.) from Aasleagh (Mayo) on the 24th, and 48 mm. (1·89 in.) from Watchet (Devon) on the 26th. The worst gales occurred on the night of the 26th-27th, when gusts of 72 m.p.h. were recorded. The secondary depression which gave rise to these gales was situated over the Bay of Biscay on the morning of the 26th, and, deepening rapidly, moved northwards to the Irish Sea by 7h. on the 27th. The area first affected by the disturbance was the English Channel and south-east England, where the wind rose rapidly to gale force in the early hours of the morning. Gales were first reported from S at 22h. on the 26th at Dungeness, from SSE at midnight at Portland Bill, and from SSE at 1h. on the 27th at Calshot. Later the affected area spread northwards, force 9 being reported from Gorleston at 5h., and force 10 from SSE from Spurn Head at 6h. At 7h. gales between SSE and SSW were general south-eastwards of a line from Spurn Head to Portland Bill. After this, though the area of strong winds continued to spread northwards, the force of the winds in the area was less, and the gales in the south began to subside. Pressure rose rapidly in the rear of the depression, and at 13h. the disturbance was centred near the Mull of Galloway. Pressure changes were especially rapid along the coasts of Dorset and Hampshire, the barogram at Portland Bill showed a fall and rise of 9 mb. within the 5 hours ending 5h. on the 27th. The highest gusts reached (72 m.p.h.) were reported from Petersfield and South Farnborough. At Kew Observatory there was a gust of 57 m.p.h., and along the coasts many places recorded gusts of over 60 m.p.h. Much damage was done to shipping in the English Channel, and, as the gale was still raging at the time of high tide, the sea broke over the front at several of the south coast towns and flooded the streets.

The total rainfall for the month varied very much over different parts of the British Isles, as much as 340 mm. (13·40 in.) were measured at Benmore (Isle of Mull), 309 mm. (12·17 in.) at Dungeon Ghyll (Westmoreland) and 275 mm. (10·83 in.) at Delphi Lodge (Mayo), while at Middlesbrough (Yorks) and Nairn only 18 mm. (0·70 in.) and 22 mm. (0·88 in.) occurred respectively. For the first time since March the rainfall for the month for the British Isles as a whole was below the average.

Mean pressure for November was above the average over the greater part of Europe, the maximum excess being over the North Sea and Denmark (+7 mb. at Blaavands Huk). Over western Iceland and northern Scandinavia the pressure was below normal (—4 mb. at Vardo). Depressions passing northwards of the British Isles caused many gales on the northern and western

coasts, and heavy weather was experienced on the Atlantic, trans-Atlantic liners being delayed. Temperature was generally above normal, and precipitation deficient, except in the extreme north, where there was a slight excess. After the first few days of the month the stormy unsettled weather, so prevalent in October, gave place to a fine quiet period, with much mist or fog. Some high temperatures were recorded at the beginning of the month, 73° F. at Geneva* on the 3rd, and 72° F. at Toulouse on the 6th. At the end of the month much colder weather prevailed generally, and intense frost persisted in northern Scandinavia, where — 8° F. was reported from Gillivare on the 30th. Snow fell in Scandinavia and in parts of Central Europe. On the 26th-27th a gale swept across north-west Europe. Its effect was mostly felt on the coasts of the English Channel,† but a wind of force 9 (50 m.p.h.) was reported from Rochefort at 8h. on the 26th.

Owing to the long continued drought in the north-eastern United States, which did not break until the middle of the month, many forest fires were reported at first. A light fall of snow occurred in New York on the 9th. Heavy rains occurred in Jamaica and Cuba in the first half of the month, and large areas in Jamaica were flooded.

Floods were again reported in India at the beginning of the month, near Allahabad, but they were not severe enough to cause interruption of traffic. On the 19th, a violent cyclonic storm passed from the Bay of Bengal over the land to the south of Calcutta, causing some damage.

The reports of rainfall in Australia show that rain was generally sufficient. Parts of New South Wales were threatened by floods at the middle of the month, but the rain moderated at the end.

The special message from Brazil states that the rainfall was 9 mm. and 30 mm. below normal in the northern and southern districts respectively. In the central regions the rainfall was very irregular, though the total for the month was 32 mm. above normal. The grain crops in the south, and the cane in the north suffered from the lack of rain. Many anticyclones passed across the country for the time of year. At Rio de Janeiro pressure was 0·8 mb. above normal and temperature 1·3° F. below normal.

Rainfall November, 1924: General Distribution

England and Wales	86	per cent. of the average 1881-1915.
Scotland	68	
Ireland	103	
British Isles	85	

*A temperature of 74°F. was recorded at Geneva in November, 1895, This was the only occasion of such a high reading in November in the years 1851-1900.

† See p. 272.

Rainfall: November, 1924: England and Wales

CO.	STATION.	In.	mm.	Per-cent. of Av	CO.	STATION.	In.	mm.	Per-cent. of Av.
Lond.	Camden Square.....	2·50	63	106	*War.*	Birminghm, Edgbaston	2·02	51	85
Sur .	Reigate, Hartswood...	3·20	81	110	*Leics*	Leicester Town Hall...	2·03	52	...
Kent.	Tenterden, View Tower	3·29	84	109	,, .	Belvoir Castle.....	1·93	49	87
,, .	Folkestone, Boro. San.	2·75	70	...	*Rut .*	Ridlington.....	1·83	47	...
,, .	Broadstairs	2·13	54	86	*Linc.*	Boston, Skirbeck	1·78	45	89
,, .	Sevenoaks, Speldhurst.	3·82	97	...	,, .	Lincoln, Sessions House	1·11	26	59
Sus .	Patching Farm.....	2·40	61	67	,, .	Skegness, Estate Office.	1·53	39	71
,, .	Eastbourne, Wilm. Sq.	2·97	75	85	,, .	Louth, Westgate	1·76	45	68
,, .	Tottingworth Park....	4·29	109	116	,, .	Brigg	1·36	35	60
Hants	Totland Bay, Aston...	2·66	67	85	*Notts.*	Worksop, Hodsock....	1·32	33	67
,, .	Fordingbridge, Oaklnds	38·4	97	112	*Derby*	Mickleover, Clyde Ho..	1·68	43	75
,, .	Portsmouth, Vic. Park.	2·50	63	83	,, .	Buxton, Devon. Hos...	2·56	65	55
,, .	Ovington Rectory	3·58	91	108	*Ches.*	Runcorn, Weston Pt...	1·50	38	54
,, .	Grayshott	3·40	86	100	,, ..	Nantwich, Dorfold Hall	1·53	39	...
Berks	Wellington College...	2·50	63	98	*Lancs*	Bolton, Queen's Park .	2·43	62	...
,, .	Newbury, Greenham..	3·16	80	113	,, ..	Stonyhurst College....	3·88	99	86
Herts.	Bennington House....	...	..	...	,, ..	Southport, Hesketh...	1·50	38	48
Bucks	High Wycombe	2·76	70	111	,, ..	Lancaster, Strathspey.	2·64	67	...
Oxf..	Oxford, Mag. College..	1·80	46	81	*Yorks*	Sedbergh, Akay	5·41	137	104
Nor .	Pitsford, Sedgebrook..	2·29	58	104	,, .	Wath-upon-Dearne ...	1·74	44	85
,, .	Eye, Northolm.....	2·22	56	...	,, .	Bradford, Lister Pk...	2·67	68	91
Beds.	Woburn, Crawley Mill.	2·58	65	113	,, .	Oughtershaw Hall	6·19	157	...
Cam.	Cambridge, Bot. Gdns.	2·18	55	113	,, .	Wetherby, Ribston H..	2·50	63	107
Essex	Chelmsford, CountyLab	3·34	85	...	,, .	Hull, Pearson Park ...	1·66	42	76
,, .	Lexden, Hill House...	3·00	76	...	,, .	Holme-on-Spalding ...	1·59	40	...
Suff .	Hawkedon Rectory ...	2·80	71	123	,, .	Lowthorpe, The Elms.	1·71	43	70
,, .	Haughley House.....	1·85	47	...	,, .	West Witton, Ivy Ho..	1·87	47	...
Norf.	Beccles, Geldeston....	1·24	31	53	,, .	Pickering, Hungate ...	1·27	32	...
,, .	Norwich, Eaton	1·44	37	56	,, .	Middlesbrough	0·70	18	33
,, .	Blakeney	1·89	48	85	,, .	Baldersdale, Hury Res.	2·68	68	70
,, .	Swaffham	2·08	53	86	*Durh.*	Ushaw College	1·67	43	66
Wilts.	Devizes, Highclere....	2·84	72	107	*Nor .*	Newcastle, Town Moor.	1·34	34	55
Dor .	Evershot, Melbury Ho.	4·36	111	102	,, .	Bellingham Manor....	1·62	41	...
,, .	Weymouth, Westham..	3·91	99	126	,, .	Lilburn Tower Gdns...	1·27	32	...
,, .	Shaftesbury, Abbey Ho.	3·86	98	120	*Cumb*	Penrith, Newton Rigg..	3·12	79	94
Devon	Plymouth, The Hoe...	4·31	109	119	,, .	Carlisle, Scaleby Hall .	2·05	52	68
,, .	Polapit Tamar	3·75	95	88	,, .	Seathwaite	14·70	373	108
,, .	Ashburton, Druid Ho..	5·63	143	99	*Glam.*	Cardiff, Ely P. Stn.....	3·75	95	90
,, .	Cullompton	4·48	114	130	,, .	Treherbert, Tynywaun	6·75	171	...
,, .	Sidmouth, Sidmount ..	3·66	93	117	*Carm*	Carmarthen Friary....	2·93	74	59
,, .	Filleigh, Castle Hill ...	3·72	95	...	,, .	Llanwrda, Dolaucothy.	4·64	118	79
,, .	Hartland Abbey.....	2·87	73	...	*Pemb*	Haverfordwest, Portf'd	4·23	107	84
Corn.	Redruth, Trewirgie ...	4·49	114	92	*Card.*	Gogerddan.....	1·99	51	42
,, .	Penzance, Morrab Gdn.	3·10	79	68	,, .	Cardigan, County Sch. .	2·40	61	...
,, .	St. Austell, Trevarna..	5·10	129	104	*Brec .*	Crickhowell, Talymaes	4·00	102	...
Soms	Chewton Mendip	3·87	98	90	*Rad .*	Birm.W.W.Tyrmynydd	4·97	126	75
,, .	Street, Hind Hayes ...	2·65	67	...	*Mont.*	Lake Vyrnwy	4·66	118	84
Glos..	Clifton College	3·12	79	99	*Denb.*	Llangynhafal	1·65	42	...
,, .	Cirencester	2·37	60	77	*Mer .*	Dolgelly, Bryntirion..	4·26	108	69
Here.	Ross, County Obsy.	2·90	74	115	*Carn.*	Llandudno	1·36	35	44
,, .	Ledbury, Underdown.	2·60	66	107	,, .	Snowdon, L. Llydaw 9	10·53	267	...
Salop	Church Stretton.....	2·49	63	85	*Ang .*	Holyhead, Salt Island.	3·03	77	73
,, .	Shifnal, Hatton Grange	1·77	45	74	,, .	Lligwy	2·48	63	...
Staff.	Tean, The Heath Ho...	1·86	47	63	*Isle of Man*				
Worc.	Ombersley, Holt Lock.	2·31	58	101		Douglas, Boro' Cem...	4·31	109	90
,, .	Blockley, Upton Wold.	...	..	...	*Guernsey*				
War.	Farnborough.....	2·73	69	100		St. Peter Port, Grange.	1·81	46	43

Rainfall: November, 1924: Scotland and Ireland

CO.	STATION	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm.	Per-cent. of Av.
Wigt.	Stoneykirk, Ardwell Ho	3·97	101	100	*Suth.*	Loch More, Achfary	5·68	144	66
,, .	Pt. William, Monreith	2·67	68	...	*Caith*	Wick	1·49	38	47
Kirk.	Carsphairn, Shiel.	4·73	120	...	*Ork .*	Pomona, Deerness	2·62	67	67
,, .	Dumfries, Cargen	2·92	74	65	*Shet .*	Lerwick	2·71	69	64
Dum	Drumlanrig	3·39	86	81					
Roxb	Branxholme	1·86	47	56	*Cork.*	Caheragh Rectory	5·55	141	...
Selk .	Ettrick Manse	4·52	115	...	,, ..	Dunmanway Rectory	5·77	147	93
Berk.	Marchmont House	1·57	40	52	,, ..	Ballinacurra	5·20	132	130
Hadd	North Berwick Res.	1·50	38	67	,, ..	Glanmire, Lota Lo.	6·23	158	145
Midl	Edinburgh, Roy. Obs.	1·10	28	51	*Kerry*	Valencia Obsy.	5·39	137	...
Lan .	Biggar	1·77	45	62	,,	Gearahameen	8·60	218	99
Ayr .	Kilmarnock, Agric. C.	2·83	72	75	,, .	Killarney Asylum	4·11	104	73
,, .	Girvan, Pinmore	4·27	109	82	,, .	Darrynane Abbey	3·78	96	74
Renf.	Glasgow, Queen's Pk.	2·57	65	69	*Wat .*	Waterford, Brook Lo.	4·89	124	129
,, .	Greenock, Prospect H.	5·31	135	83	*Tip .*	Nenagh, Cas. Lough	4·16	106	103
Bute.	Rothesay, Ardencraig	3·52	89	69	,, .	Tipperary	4·51	115	...
,, .	Dougarie Lodge	3·53	90	...	,, .	Cashel, Ballinamona	4·57	116	131
Arg .	Glen Etive	9·90	251	...	*Lim .*	Foynes, Coolnanes	3·38	86	85
,, .	Oban	5·49	139	...	,, .	Castleconnell Rec.	4·97	126	...
,, .	Poltalloch	5·60	142	101	*Clare*	Inagh, Mount Callan	...	..	...
,, .	Inveraray Castle	6·91	175	82	,, .	Broadford, Hurdlest'n.	5·12	130	...
,, .	Islay, Eallabus	4·77	121	89	*Wexf*	Newtownbarry	5·13	130	...
,, .	Mull, Benmore	13·40	340	...	,, .	Gorey, Courtown Ho.	2·88	73	83
Kinr.	Loch Leven Sluice	2·57	65	72	*Kilk.*	Kilkenny Castle	4·13	105	134
Perth	Loch Dhu	6·95	177	80	*Wic .*	Rathnew, Clonmannon	2·96	175	...
,, ..	Balquhidder, Stronvar.	4·98	127	62	*Carl .*	Hacketstown Rectory	4·17	106	107
,, ..	Crieff, Strathearn Hyd.	2·43	62	56	*QCo..*	Blandsfort House	4·27	09	128
,, ..	Blair Castle Gardens	2·37	60	...	,,	Mountmellick	5·26	134	...
,, .	Coupar Angus School	2·12	54	76	*KCo.*	Birr Castle	4·09	104	132
Forf.	Dundee, E. Necropolis	2·00	51	82	*Dubl.*	Dublin, FitzWm. Sq.	2·25	57	84
,, .	Pearsie House	2·83	72	...	,, .	Balbriggan, Ardgillan	2·38	61	83
,, .	Montrose, Sunnyside	1·95	50	74	*Me'th*	Drogheda, Mornington	2·71	69	...
Aber.	Braemar Bank	2·24	57	58	*W.M*	Mullingar, Belvedere	4·13	105	121
,, .	Logie Coldstone Sch.	2·18	55	71	*Long*	Castle Forbes Gdns.	4·94	125	137
,, .	Aberdeen, Cranford Ho	2·77	70	86	*Gal .*	Galway, Waterdale	...	..	...
,, .	Fyvie Castle	2·80	71	...	,, .	Ballynahinch Castle	6·80	173	...
Mor .	Gordon Castle	1·31	33	45	*Mayo*	Mallaranny	7·83	199	...
,,	Grantown-on-Spey	1·30	33	43	,, .	Westport House	5·19	132	106
Na .	Nairn, Delnies	0·88	22	37	,, .	Delphi Lodge	10·83	275	...
Inv..	Ben Alder Lodge	3·93	100	...	*Sligo*	Markree Obsy.	5·22	133	123
,, .	Kingussie, The Birches	1·50	38	...	*Ferm*	Enniskillen, Portora	3·07	78	...
,, .	Fort Augustus	...	..	...	*Arm.*	Armagh Obsy.	2·61	66	92
,, .	Loch Quoich, Loan	9·60	244	...	*Down*	Warrenpoint	3·38	86	...
,, .	Glenquoich	8·83	224	73	,, .	Seaforde	3·71	94	98
,, .	Inverness, Culduthel R.	1·03	26	...	,, .	Donaghadee	2·84	72	93
,, .	Arisaig, Faire-na-Squir	4·87	124	...	,, ..	Banbridge, Milltown	2·01	51	73
,, .	Fort William	6·08	154	75	*Antr.*	Belfast, Cavehill Rd.	4·08	104	...
,, .	Skye, Dunvegan	5·42	138	...	,, .	Glenarm Castle	3·73	95	...
,, .	Barra, Castlebay	2·56	65	...	,, .	Ballymena, Harryville	2·95	75	73
R&C	Alness, Ardross Cas.	2·03	52	50	*Lon .*	Londonderry, Creggan	2·87	73	70
,, .	Ullapool	2·02	51	...	*Tyr .*	Donaghmore	3·33	85	...
,, .	Torridon, Bendamph	6·42	163	69	,, .	Omagh, Edenfel	3·23	82	85
,, .	L. Carron, Plockton	...	..	...	*Don .*	Malin Head	3·03	77	92
,, .	Stornoway	4·14	105	71	,, .	Rathmullen	2·99	76	...
Suth.	Lairg	1·89	48	...	,, .	Dunfanaghy	3·92	100	83
,, .	Tongue Manse	2·00	51	44	,, .	Killybegs, Rockmount	6·41	163	102
,, .	Melvich School	2·13	54	53					

Climatological Table for the British Empire, June, 1924

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean Wet Bulb.			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible.
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal								
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0—10	mm.	mm.			
London, Kew Obsy.	1016·6	− 0·1	79	44	68·5	52·0	60·3	+ 1·1	57·2	72	6·7	87	+ 32	11	6·6	40
Gibraltar	1016·1	− 1·3	89	60	78·9	65·1	72·0	+ 1·5	64·2	67	3·0	0	− 12	0	...	...
Malta	1015·2	+ 0·6	87	64	79·4	68·6	74·0	+ 2·0	67·7	70	3·5	5	+ 3	4	10·7	74
Sierra Leone	1012·7	0·0	91	69	85·7	72·2	78·9	− 1·6	75·7	82	6·5	674	+184	28	...	...
Lagos, Nigeria	1010·1	− 2·8	91	72	86·7	75·6	81·1	+ 2·5	77·0	76	4·9	140	−343	14	...	...
Kaduna, Nigeria	1014·0	+ 0·2	99	65	86·5	69·6	78·1	+ 1·6	72·8	81	1·1	201	− 24	18	...	...
Zomba, Nyasaland	1017·2	− 0·2	80	49	74·1	54·1	64·1	+ 1·6	...	87	4·5	10	− 5	4	...	...
Salisbury, Rhodesia	1018·3	− 1·9	77	36	71·5	45·9	58·7	+ 2·3	51·0	58	2·1	2	+ 1	1	...	...
Cape Town	1020·0	− 0·3	73	36	62·5	47·3	54·9	− 0·9	51·7	79	5·5	121	+ 8	16	...	...
Johannesburg	1024·0	− 0·4	68	28	59·9	39·9	49·9	− 0·8	38·3	54	1·4	1	− 2	1	9·6	91
Mauritius	1020·1	+ 1·1	77	61	75·0	64·0	69·5	+ 0·1	...	78	5·3	37	− 34	11	7·0	65
Bloemfontein	...	...	71	18	61·3	29·4	45·3	− 2·3	35·5	69	0·1	1	− 11	1	...	...
Calcutta, Alipore Obsy.	998·4	− 1·3	111	74	97·6	81·5	89·5	+ 4·4	80·7	77	6·5	211	− 79	5*	...	...
Bombay	1004·3	+ 0·1	95	76	90·5	81·3	85·9	+ 2·0	78·8	73	5·6	189	−280	11*	...	...
Madras	1003·9	+ 0·1	107	74	101·6	81·5	91·5	+ 1·6	75·7	53	6·4	88	+ 40	6*	...	...
Colombo, Ceylon	1009·3	+ 1·0	87	73	85·5	76·6	81·1	− 0·8	77·8	76	8·8	177	− 15	22	4·9	39
Hong Kong	1005·1	− 1·0	90	73	84·3	77·6	80·9	− 0·6	76·6	83	8·9	588	+190	21	4·2	32
Sandakan	...	...	90	73	87·9	75·0	81·5	− 0·2	77·5	79	...	124	− 61	9	...	...
Sydney	1020·1	+ 2·2	77	40	62·2	47·4	54·8	+ 0·4	49·4	68	5·0	51	− 76	12	5·2	53
Melbourne	1020·2	+ 1·7	60	34	54·6	42·9	48·7	− 1·7	46·5	80	7·1	30	− 23	21	3·0	32
Adelaide	1021·3	+ 2·2	64	35	59·1	45·3	52·2	− 1·2	47·8	74	5·9	94	+ 16	16	4·5	47
Perth, W. Australia	1019·9	+ 1·9	74	42	65·5	49·1	57·3	+ 0·7	52·1	70	5·0	130	− 42	14	5·2	52
Coolgardie	1021·2	+ 2·1	76	36	64·5	43·5	54·0	+ 1·3	48·7	38	4·1	5	− 26	3	...	...
Brisbane	1019·7	+ 1·7	75	43	68·1	50·7	59·4	− 0·7	55·2	66	4·5	122	+ 57	7	6·6	65
Hobart, Tasmania	1015·1	+ 0·8	61	33	52·1	40·1	46·1	− 0·7	43·1	77	5·8	71	+ 15	15	4·1	46
Wellington, N.Z.	1016·1	+ 1·8	62	32	55·6	44·8	50·2	+ 0·5	47·2	79	6·4	75	− 46	21	4·0	43
Suva, Fiji	1014·5	+ 0·9	84	67	79·0	70·9	74·9	0·0	72·8	87	7·4	639	+483	23	...	...
Apia, Samoa	1012·3	+ 0·7	88	71	84·9	74·3	79·6	+ 2·0	76·3	80	6·3	258	+121	15	6·6	58
Kingston, Jamaica	1013·9	+ 0·1	93	70	89·8	73·3	81·5	− 0·2	74·7	67	6·0	20	− 85	4	...	...
Grenada, W.I.	1014·0	+ 0·7	88	72	84·3	74·4	79·3	+ 0·5	75·5	78	5·7	148	− 71	26	...	...
Toronto	1013·0	− 1·3	82	39	73·1	52·7	62·9	+ 0·3	56·7	71	5·1	44	− 26	14	8·6	56
Winnipeg	1012·3	− 0·2	84	32	71·0	45·9	58·5	− 3·7	57·9	73	4·6	29	− 54	9	8·4	52
St. John, N.B.	1012·3	− 1·7	75	42	64·6	47·6	56·1	− 0·4	51·3	77	6·1	59	− 24	12	7·6	49
Victoria, B.C.	1017·1	+ 0·2	83	45	64·6	48·9	56·7	− 0·3	51·1	78	4·0	14	− 10	7	9·2	57

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.